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ABSTRACT

Already available inexpensive computers with fast printers could significantly reduce the size and complexity of the task of individualizing instruction. A computer-based system could be designed to store and analyze student characteristics, compare relevant factors with instructional objectives, and prescribe learning activities selected from a bank which reflected the characteristics of the school's staff, facilities, equipment, materials, and available time. Teachers today are prepared to provide for individual differences but may become frustrated because of restrictions imposed by current planning and organization systems. Computer-based lesson planning could help match learner readiness and learning activities to use large-group instruction more effectively in individualizing, and provide faster, more valid analyses of the relative value of various learner characteristics for planning instruction. Implementation of a computer-based system will require new staffing configurations and consideration of cost effectiveness, the issue of alienation, and the need to provide heterogeneous group activities to teach group process skills and attitudes. (LMM)

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USE COMPUTERS TO PLAN INSTRUCTION

by

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Many efforts to improve curriculum and teaching in American schools in recent years have been designed to increase the individualization of instruction. The efforts have taken a wide variety of forms but all have had to confront the problem of controlling a great many variables in short periods of time. The size and complexity of the task has defeated many enthusiastic teachers and curriculum planners who have attempted improvements and innovations.

Inexpensive computers with fast printers are available now which could significantly reduce this problem. The opportunity exists now to adapt this new technology to produce instructional prescriptions based on individual student's levels of achievement and personal characteristics.

A computer-based system could be designed to store and analyze student characteristics and compare relevant factors with instructional objectives, and then prescribe learning activities selected from a bank which reflected the characteristics of a school's staff, facilities, equipment, materials, and available time. Such a system could provide increased efficiency by prescribing large group instruction when large numbers of learners were ready and needed to experience a particular learning activity. The savings in resources then would be available for more small group and

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individual instruction.

Teacher Readiness

Teachers today are more able to provide for individual differences than ever before. The teachers working in classrooms now are trained and experienced in providing a wide variety of individual, small group, and large group learning activities. They are adept at using a variety of electronic devices and other communications media. They know how to use a more systematic approach to planning, and they understand behavioral objectives and the diagnostic-prescriptive methods.

Teachers today are sensitive to cultural differences; they understand the effects of individual interests and motivations. They know how to provide for slow learners, handicapped learners, and the gifted. They know something about learning styles and the effects of differing teaching styles. Teachers have a strong interest in the work of Piaget and the findings of recent brain growth research.

Many attempts have been made in recent years to reduce the rigidity of group instruction. Open space classrooms, team teaching, flexible scheduling, and self paced instructional materials all have been notable efforts.

Because individualized instruction is more effective, determined teachers tend to expend great amounts of energy in personal efforts to provide more of it. These teachers become frustrated because they know what needs to be done and how to do it, but do not have the time and energy to get it done. They are restricted in the use of their skills and creativity by the systems of planning and organization in which they presently work.

Planning and Record Keeping

Methods of lesson planning presently used in schools tend to be narrow, rigid and burdensome. The best lesson plans are detailed and thorough; the worst are irrelevant, or sketchy. Lesson plans are a necessary source of strength and security for some teachers. Consequently, they devote much time to writing lesson plans. For others, lesson planning is a loathesome chore.

After a few years of teaching, most teachers have settled into a personal pattern of lesson planning. They often develop a syllabus for their teaching assignments. Among their most useful possessions as teachers are sets of activities which work, i.e. bags of tricks carefully gathered, sorted, and refined over the years. These ideas for activities, these tricks of the trade, are exchanged with colleagues

and shared with a wider audience through publications. The ideas often serve as the content for inservice sessions. In a computer-based system, these sets of activities could become the basic bank of learning activities from which prescriptions would be selected.

Teachers grade books presently used in schools are simple and limiting. They should disappear in the next generation to be replaced by computer produced lists, directions, and report forms. A great advantage of keeping grade book information in a computer memory would be the opportunity to produce progress reports at any time. Routine reports to parents may still be desirable, but a computer constantly comparing recorded progress with anticipated progress could produce reports on command.

An essential feature of a computer-based system would be its ability to produce statements of anticipated achievement growth for an individual learner's educational history and unique characteristics. The computer-based system could alert teachers and counselors when the rate of progress for a particular student fell outside a range of expected progress. If a student was falling behind, the computer could call for an investigation. If a student was making greater progress than expected, the computer, likewise, could signal for an investigation. In either case, the

assumption would be that something unusual was happening in the life of the individual student, or that the information in the student record was incorrect or obsolete. In effect, the computer would be saying that something unexpected was happening, and that human intervention was needed.

As new information was added to a student's record, the computer could adjust the projections. The more valid and complete the student record, the more precise the projections. With that kind of support, teachers would become even more creative in developing and conducting learning activities.

Individualized Instruction

Teachers strive for individualized instruction because it is more effective, efficient, and humane. Individualized instruction can take many forms ranging from one student being personally instructed by one teacher to many equally able and ready students engaged in the same learning activity at the same time. The essential factor is the match between the learner's readiness and the learning activity.

If a large number of students are at the same level of achievement with respect to an instructional objective and they all are able to benefit from the same activity, then efficiency requires that large group instruction be used. Large group instruction

is less effective when it is used inappropriately, i.e. when many of the students in the group are not benefitting because they have already mastered the objective, or when many are not ready for the activity. Standard classrooms with age-level groups and ability groups traditionally have been organized to reduce the range of differences in a group of learners.

One-to-one teaching and small student-teacher ratios are desirable but are expensive. Excellent teaching is possible when an able, sensitive teacher works with one student. An enthusiastic, gifted child studying and practicing under the direction of an empathetic and talented mentor can make dramatic growth in achievement. It is commonly accepted that handicapped learners need more individual attention from their teachers to make achievement gains comparable to their more normal peers. These methods of individualizing instruction, though expensive, could be used more often in schools if alternated with more large group instruction. Computer-based lesson planning could provide this.

Individual Differences

Some notion of the range and complexity of individual differences within a group of learners can be gained by examining a list of the great variety

of the characteristics of learners. Such a list would include for each learner: (1) levels of achievement; (2) potentials for achievement -- intelligence, talents, aptitudes; (3) interests; (4) motivations; (5) learning style; (6) cultural and social background; (7) maturity -- physical, social, intellectual, moral; (8) cognitive development -- Piaget stage; (9) brain growth stage -- presence or absence of a plateau; (10) physical size and growth rate; (11) strength and endurance; (12) handicaps, single or combinations -- mental retardation, learning disability, emotional disturbance, poor physical health, impaired vision, impaired hearing, restricted motor ability.

The relative importance of any of the characteristics of learners for planning instruction must be a matter of continuing concern. Experience and research will continue to revise the values or weights of the various characteristics in planning instruction. Computer based planning would provide faster and more valid analyses.

Junior high and middle school teachers seem to face the greatest difficulties in accommodating individual differences. Students at this age vary greatly in physical size, development, and maturity. Growth spurts and emotional stress compound the problem.

The interests of pre-adolescents and early adolescents are more varied and changeable than any other group of school-age children.

The wide range and rapidly changing differences among junior high and middle school learners increases the difficulty of providing individualized instruction. Because of this, computer-based systems of planning and record-keeping probably will appear first at this level.

Staffing

A computer-based system will require new staffing configurations. Computer operators might process data at night and on week-ends to produce documents for teachers as they report for work. Clerks would be needed who could post student progress information from check lists, examinations, sets of papers, and routine reports.

Curriculum analysts working in schools would be required to maintain and improve the system. The analysts would evaluate and up-date the school's statements of instructional objectives, the activities bank, and the program of tests and measurement. An important responsibility of the analysts would be the on-going work with teachers in building and improving the activities bank. Curriculum analysts would provide the direct supervision of the computer operators and

clerks.

A computer-based system would require a change in teacher duties. Teachers now have a full work day. The implementation of a computer-based system would require provisions for training teachers in the reduction and elimination of old work as well as in how to do the new work. Many of the past attempts to increase the individualization of instruction have added to teacher work load without compensating reductions. The failure of many efforts to increase individualized instruction has been due to the piling-on of more work on teachers.

Precautions

Administrators and researchers must continue to monitor the cost effectiveness of efforts to individualize instruction. The allocation of limited resources is a sensitive business. The use of computers at the school level will enable administrators to make more rapid and detailed analyses. A computer-based system for individualizing instruction should help all members of a school staff make more efficient use of limited resources.

Alienation, which is a continuing problem in schools, seems to be increased when routine work is automated. As computer-based systems of lesson planning and record keeping enter schools, it would be

important to involve students and parents at all stages of implementation. Administrators, teachers, and counselors would need to find effective ways to explain and discuss the system and its benefits.

A computer-based system would need to provide for enough heterogeneous group activities so that important group process skills and attitudes are taught. Schools typically organize heterogeneous groups now to give learners the highly valued experiences of working cooperatively with others of differing abilities, interests, and backgrounds. It will be important to guard against the negative effects of too much homogeneous grouping.

Conclusion

Microcomputers with fast printers and versatile photocopy machines are causing a major revolution in the processing and communicating of information. It is imperative that teachers adapt the new technology to make their work more effective. The questions of who does the research and development work and how it is accomplished should be confronted now and answered soon. The amount of work to be done is great, but the results could be revolutionary.